E7.3 10813

CR-133297

Type I Progress Report

July 1973

a. "Use of Satellite Imagery for Wildland Resource Evaluation

in the Great Basin."

b. GSFC Identification Number - U263

c. Statement of Problems - Most general problems have been solved.

Cloud cover, previously a problem, is diminishing as the clearer

summer atmosphere is becoming more prevalent.

d. Accomplishments

A major thrust of our recent work has been to develop a series of vegetal type overlays for our 1:1 million scale ERTS mosaic. It is felt that these overlays will be far more accurate than previous vegetal type maps of Nevada produced by various state and Federal agencies due to the superiority of ERTS imagery for this type of work.

The pinyon/juniper overlay has been completed and is being refined as new data (ERTS imagery and ground truth) is received. Snow cover has been a major help in mapping pinyon/juniper (see the progress report dated May 1973), but with the absence of snow we must rely more on ground observations and large scale photography for these refinements.

Previous work done on the mapping of phreatophytic and agricultural vegetation (using MSS bands 5 and 7) has been updated using color composites and has been transferred to a mosaic overlay. Color composites are superior to black and white imagery for the detection of phreatophytic vegetation due to the characteristic high infrared reflectance emitted from this type. The identification and delineation of this vegetation type can be accomplished in less time and with more accuracy using color composites.

A separate mosaic overlay has been prepared for the meadows of Nevada. For our purposes, a meadow consists of various combinations of grasses and grass-like plants (sedges and rushes). Interspersed within many of these meadows are willows and cottonwoods. Some alfalfa fields may also be included, as they sometimes occur within natural meadow areas. Figure 1 shows an example of the meadows mapped in Elko County, Nevada, as

identified on ERTS imagery.

The salt desert shrub vegetation, such as shadscale, saltbrush, and greasewood, has been mapped on a mosaic overlay. This vegetation was difficult, if not impossible, to differentiate from the surrounding northern and southern desert shrub types based solely upon reflectance. Therefore, it was necessary to use other criteria such as geographic location, soil reflectance, and elevation in identifying this vegetal type. The criteria used to identify salt desert shrub vegetation are as follows:

1. It is generally below 5,000 feet, except for some higher internal drainage basins.

2. It is usually associated with light colored, highly reflective alkali soils where water frequently moves or stands and evaporation is high.

3. Shadscale is found a short distance up the slopes in the northern half of the state and nearly all the way up the slopes in the southern half.

4. Salt desert shrub is closely associated with the pleistocene lakes in western and northern Nevada (a pleistocene lake map of Nevada was used for this comparison).

5. Fields, meadows, and other phreatophytic vegetation is often associated with salt desert shrub in valley bottoms.

6. Barren areas (playas) are generally found in the internal drainage basins with salt desert shrub always found surrounding them.

These criteria, plus ERTS imagery, published vegetal type maps, and ground observation were used to map the salt desert shrub.

In like manner, the southern desert shrub type was delineated and a mosaic overlay was prepared. This vegetation shows little or no reflectance, and identification was therefore based primarily on location and landform. The basic criteria used were: (1) This vegetation is found in the southern portion of the state, generally below 5,000 feet; and (2) it is usually found in valley bottoms extending nearly to the top of the alluvial fans before it gives way to juniper, sagebrush, oak woodland and mountain brush. ERTS data and ground observations were used along with these criteria to map this vegetation type.

In progress is the mapping of the northern desert shrub type. Lower ecotones of the pinyon/juniper type are first delineated and then the upper ecotones of the salt desert shrub type are delineated. The vegetation between these two types is generally northern desert shrub, excluding meadows, agriculture and mountain brush communities. It also cannot be discerned by means of vegetation reflectance alone.

Fire scars and seedings were mapped on individual frames and then transferred to a mosaic overlay. These maps will have to be continually updated as new imagery becomes available. The mountain brush type will also be mapped on a mosaic overlay, but acquisition of spring and summer growing season imagery is needed before this can begin. Mountain brush is highly infrared reflective during the growing season, and it is anticipated that data during this time period will enable a more accurate identification of this vegetation type.

Work is continuing with the use of ERTS data in detecting vegetation change. With the acquisition of some early growing season data, we are attempting to correlate vegetation changes (for which we have

-4-

ground truth) with density changes on ERTS MSS imagery. Using a MacBeth TD-504 densitometer, readings are taken of these selected areas.

There are certain problems that must be overcome before this can be accomplished. First, the variations in transparency processing must be taken into account. This is done by standardizing a density on the density scale (at the bottom of each ERTS frame) as zero, and making every other density relative to this standard. Processing error is then eliminated. Second, we must take into account initial "exposure". This can vary due to cloud cover and other atmospheric conditions and will confound the results. Preliminary results indicate that initial exposure error must be eliminated, or diminished, if satisfactory results are to be obtained. Figure 2 shows the results of densitometry on alfalfa fields near Reno. Characteristically, alfalfa is somewhat green except during winter, but the behavior of each band does not support this phenological cycle. Our next step is to devise some method by which we can nullify initial exposure error.

We are currently in the initial phase of developing an automatic data processing system which will analyze ERTS data using digitized tapes. The programs used are being obtained from Colorado State University since they have a computer similar to ours (CDC-6400). When this system is implemented, it is anticipated that it may provide a more detailed analysis of Great Basin vegetation types as viewed by the ERTS multispectral scanning system.

e. Significant results

Most major vegetation types of Nevada have been mapped with
success. The completed set of mosaic overlays will be more accurate
and detailed than previous maps compiled by various State and Federal
agencies due to the excellent vantage point that ERTS data affords.
This new vegetation type map will greatly aid resource agencies in
their daily work. Such information as suitable grazing areas, wildlife
habitat, forage production and approximate wildland production poten-
tials can be inferred from such a map.

We have had some success in detecting vegetational changes with
the use of ERTS MSS imagery, but exposure differences have somewhat
confounded the results. Future plans include work to solve this
problem.
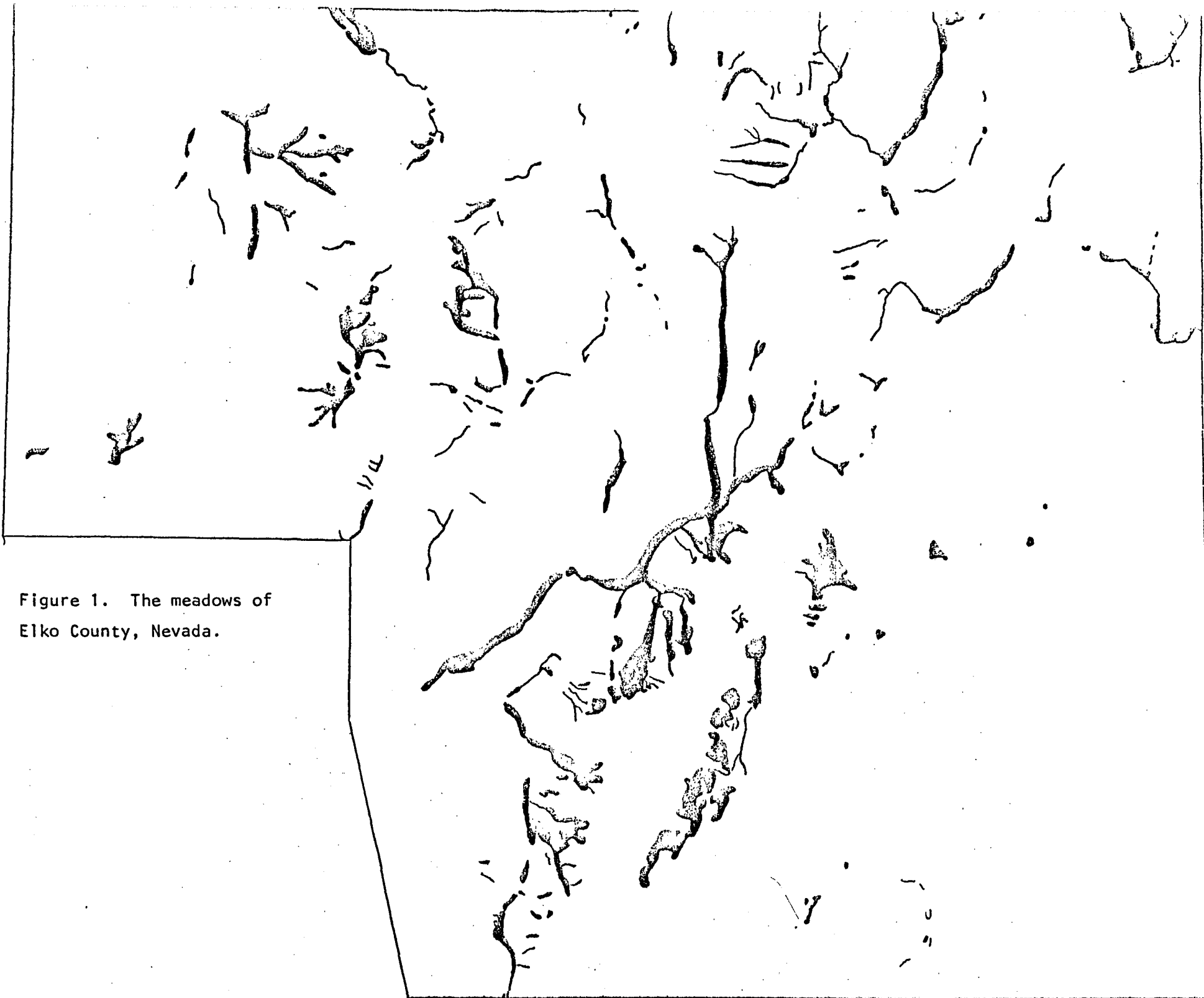
Figure 1. The meadows of
Elko County, Nevada.

Figure 2. Density changes as observed with the alfalfa
fields around Reno.

Band 4 ————
     5 — — — —
     6 —·—·—·—
     7 ··············
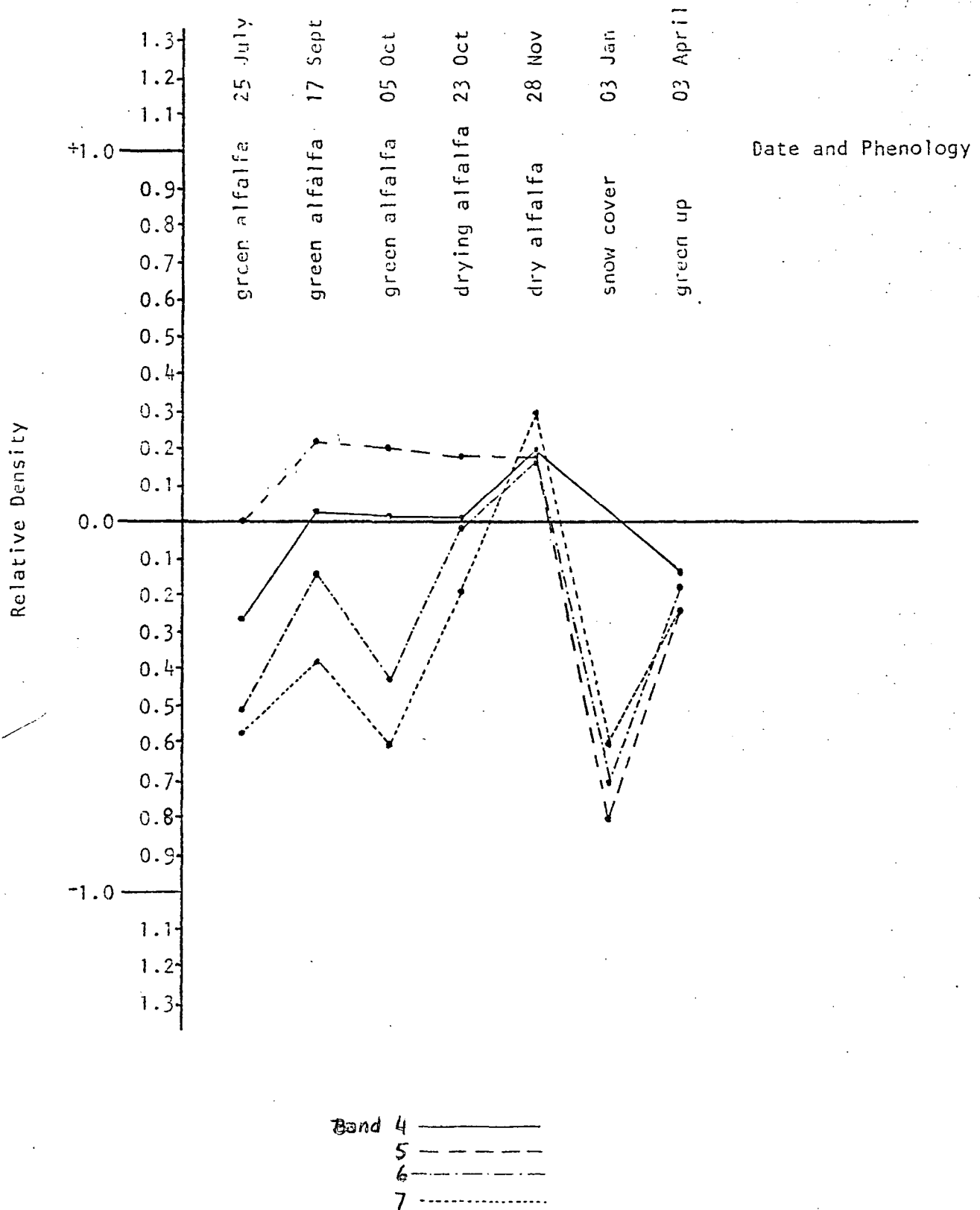
f. No published articles, papers, pre-prints, etc. have been
    released during this reporting period.

g. No recommendations for practical change will be made at this time.

h. No changes have been made in our standing order forms.

i. Image Descriptor Forms - attached

j. Data Request Forms - no data request forms were submitted during
    this reporting period.

ERTS IMAGE DESCRIPTOR FORM
(See Instructions on Back)

DATE ___July 16, 1973___

PRINCIPAL INVESTIGATOR ___Dr. Paul T. Tueller___

GSFC ___U 263___

ORGANIZATION ___University of Nevada/Reno___

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS* basin range	playa	desert	DESCRIPTORS
1197-17542 M	X	X	X	
-17545 M	X	X	X	
-17551 M	X	X	X	Mountains
-17554 M	X	X	X	Mountains
1198-17592 M			X	Agric.
1200-18105 M		x	X	Agric.
-18114 M	X	X	X	Lake
-18120 M	X	X	X	Mountains, Lake
1218-18110 M		X		Lake
-18115 M	X	X	X	Lake
-18112 M		X	X	Agric.
1232-17481 M				Agric., Lava
-17483 M	X	X	X	
1234-17594 M			X	Agric.
-18000 M	X		X	Mountains, Lake
-18005 M	X	X	X	
-18012 M	X	X	X	
1214-17480 M				Agric., Lava
-17483 M	X	X	X	Lake, Agric.
-17485 M	X	X	X	
-17492 M	X	X	X	Agric.
-17494M	X	X	X	Mountains
-17501 M	X	X	X	Lake, urban
1216-18002 M	X	X	X	Seeding
-18011 M	X	X	X	
1217-18065 M	X		X	Mountains, Lake
1235-18052 M				Agric.
-18055 M	X	X	X	Mountains
-18061 M	X	X	X	Agric.
-18064 M	X	X	X	Lake
-18070 M	X		X	Mountains, Lake
1237-18181 M				Agric.

*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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ERTS IMAGE DESCRIPTOR FORM
(See Instructions on Back)

DATE _____ July 16, 1973 _____

PRINCIPAL INVESTIGATOR ___ Dr. Paul T. Tueller ___

GSFC _____ U 263 _____

ORGANIZATION ___ University of Nevada/Reno ___

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	basin range	playa	desert	
1238-18224 M				Lake, Agric.
-18230 M				Lake, Agric.
1215-17541 M	x		x	Lake
-17550 M	x	x	x	
-17552 M	x	x	x	Mountains
-17555 M	x	x	x	Mountains
1236-18122 M	x	x	x	Mountains, Lake
1249-17432 M				
-17434 M	x	x	x	
-17441 M				Mountains
-17443 M	x		x	
-17450 M	x	x	x	Mountains Lake
1250-17481 M				Agric., Lava
-17483 M	x	x	x	Lake, Agric.
-17490 M	x	x	x	
-17492 M	x	x	x	Agric.
-17495 M	x	x	x	Mountains
1250-17501 M	x	x	x	Lake, Urban
1251-17553 M	x	x	x	Mountain
-17560 M	x	x	x	Mountains
1253-18052 M				Agric.
-18055 M	x	x	x	Mountains
-18061 M	x	x	x	Agric.
-18064 M	x	x	x	Lake
-18070 M	x		x	Mountain, Lake
1252-17594 M			x	Agric.
-18000 M	x		x	Mountains, Lake
-18012 M	x	x	x	
1254-18111 M		x		Lake
-18113 M		x	x	Agric.
18120 M	x	x	x	Lake
-18122M	x	x	x	Mountains, Lake
-255-18165 M	x	x	x	Lake

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DATE ___ July 16, 1973 ___

PRINCIPAL INVESTIGATOR ___ Dr. Paul T. Tueller ___

GSFC ___ U 263 ___

ORGANIZATION ___ University of Nevada/Reno ___

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
1255-18172 M	x	x	x	Lake
-18174 M	x	x	x	Lake
-18181 M				Agric.
1268-17490 M	x	x	x	
-17492 M	x	x	x	Agric.
-17495 M	x	x	x	Mountains
-17501 M	x	x	x	Lake, Urban
1230-17391 M	x	x	x	
1256-18224M				Lake, Agric.
-18230 M				Lake, Agric.
1266-17391 M	x	x	x	
1270-17594 M			x	Agric.
-18003 M	x	x	x	Seedings
-18005 M	x	x	x	
-18012 M	x	x	x	
1271-18052 M				Agric.
-18054 M	x	x	x	Mountains
-18061 M	x	x	x	Agric.
-18063 M	x	x	x	Lake
-18071 M	x		x	Mountains, Lake
1269-17535 M				Lava, Agric.
-17542 M	x		x	Lake
-17544 M	x	x	x	Marsh, seedings
-17551 M	x	x	x	
-17533 M	x	x	x	Mountains
-17560 M	x	x	x	Mountains
1267-17431 M	x	x	x	
-17434 M	x	x	x	
-17440 M				Mountains
-17443 M	x		x	Canyon
-17445 M	x	x	x	Lake
1273-18174 M	x	x	x	Lake
-18180 M				Agric.

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ERTS IMAGE DESCRIPTOR FORM
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DATE _____ July 16, 1973 _____

PRINCIPAL INVESTIGATOR ___ Dr. Paul T. Tueller _____

GSFC ___ U 263 _____

ORGANIZATION ___ University of Nevada/Reno _____

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
1274-18223 M				Lake, Agric.
-18230 M				Lake, Agric.
1290-18110 M		x		Lake
-18112 M		x	x	
-18115 M	x	x	x	Lake
-18121 M	x	x	x	Mountains, Lake
1291-18164 M	x	x	x	Lake
-18170 M	x	x	x	Lake
-18173 M	x	x	x	Lake
-18175 M				Agric.
1285-17431 M	x	x	x	
-17433 M	x	x	x	
-17440 M				Mountains
-17442 M	x		x	
-17445 M	x	x	x	Lake
1286-17480 M				Agric., Lava
-17482 M	x	x	x	Lake, Agric.
-17500 M	x	x	x	Lake, Urban
1287-17534 M				Lava, Agric.
-17541 M	x		x	Lake
-17552 M	x	x	x	Mountains
1287-17555 M	x	x	x	Mountains
1305-17554 M	x	x	x	Mountains
1292-18222 M				Lake, Agric.
-18225 M				Lake, Agric.
1302-17385 M	x	x	x	Lake
1289-18051 M				Agric.
-18054 M	x	x	x	Mountains
-18060 M	x	x	x	Agric.
-18063 M	x	x	x	Lake
-18065 M	x		x	Mountains, Lake

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GSFC 37-2 (7/72)

ERTS IMAGE DESCRIPTOR FORM
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DATE _____ March 25, 1973 _____

PRINCIPAL INVESTIGATOR _____ Dr. Paul T. Tueller _____

GSFC _____ U 263 _____

ORGANIZATION _____ University of Nevada _____

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	basin range	playa	desert	
1123-17432 M	x	x	x	
-17434 M				mountains
-17441 M	x		x	canyon
-17443 M	x	x	x	lake
1122-17385 M	x		x	
1125-17533 M		clouds		
-17540 M		clouds		
-17542 M	x	x	x	marsh, seeding
-17545 M	x	x	x	
-17551 M	x	x	x	mountains
-17554 M	x	x	x m	mountains
1127-18050 M				agriculture
-18053 M	x	x	x	mountains
-18055 M	x	x	x	agriculture
-18062 M	x	x	x	lake
-18064 M	x		x	mountains, lake
1129-18163 M	x	x	x	lake
-18165 M	x	x	x	lake
-18172 M	x	x	x	lake
-18174 M	x		x	mountains, lake, agriculture
1130-18224 M				mountains
1124-17475 M				agriculture
-17481 M	x	x	x	lake, agriculture
-17484 M	x	x	x	
-17490 M	x		x	agriculture, mountains
-17493 M	x	x	x	mountains
-17495 M	x	x	x	lake, urban
1128-18114 M	x	x	x	lake
-18120 M	x	x	x	mountains, lake
1143-17533 M				agriculture
-17540 M	x		x	lake
-17542 M	x	x	x	marsh, seeding
-17545 M	x	x	x	

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ORGANIZATION ___ University of Nevada, Reno _____

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	basin range	playa	desert	
1143-17551 M	x	x	x	mountains
-17554 M	x	x	x	mountains
1144-17592 M			x	agriculture
-17594 M	x		x	mountains
-18001 M	x	x	x	seeding
-18003 M	x	x	x	
-18010 M	x		x	mountains
1126-17594 M	x		x	mountains
-18001 M	x	x	x	seeding
-18003 M	x	x	x	
-18010 M	x	x	x	
1140-17385 M	x	x	x	
1141-17432 M	x	x	x	
-17435 M				mountains
-17441 M	x		x	canyon
-17444 M	x	x	x	lake
1159-17431 M	x	x	x	
-17433 M				mountains
-17440 M	x		x	canyon
17442 M	x	x	x	lake
1164-18103 M		x		lake
-18105 M		x	x	agriculture
-18112 M	x	x	x	lake
-18114 M	x	x	x	mountains, lake
1160-17474 M				agriculture
-17480 M	x	x	x	lake, agriculture
-17483 M	x	x	x	
-17485 M	x	x	x	agriculture
-17492 M	x	x	x	mountains
-17494 M	x	x	x	lake, urban
1161-17532 M				lava, agriculture
-17534 M	x		x	lake
-17541 M	x	x	x	marsh, seeding

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ORGANIZATION __University of Nevada, Reno__

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	basin range	playa	desert	
1161-17543 M	x	x	x	
-17550 M	x	x	x	
-17552 M	x	x	x	mountains
1162-17593 M	x		x	mountains, lake
-17595 M	x	x	x	seeding
-18002 M	x	x	x	
-18004 M	x	x	x	
1163-18051 M	x	x	x	mountains
-18054 M	x	x	x	
-18060 M	x	x	x	lake
-18063 M	x		x	lake, mountains
1165-18161 M	x	x	x	lake
-18164 M	x	x	x	lake
-18170 M	x	x	x	lake
-18173 M				agriculture
1176-17382 M	x	x	x	
-17385 M	x	x	x	
1178-17474 M				agriculture
-17481 M	x	x	x	lake, agriculture
-17483 M	x	x	x	
-17490 M	x	x	x	agriculture
-17492 M	x	x	x	lake, urban
-17495 M	x	x	x	lake
1179-17552 M	x	x	x	mountains
1180-17590 M	x	x	x	mountains
-17592 M	x		x	mountains, lake
-17595 M	x	x	x	seeding
-18001 M	x	x	x	
-18004 M	x	x	x	
1181-18044 M				agriculture
-18051 M	x	x	x	mountains
-18053 M	x	x	x	
-18060 M	x	x	x	lake

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PRINCIPAL INVESTIGATOR __Dr. Paul T. Tueller__

GSFC __U-263__

ORGANIZATION __University of Nevada, Reno__

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	basin range	playa	desert	
1181-18062 M	x		x	mountain, lake
1182-18103 M		x		lake
-18105 M		x	x	agriculture
1183-18164 M	x	x	x	lake
-18170 M	x	x	x	lake
-18173 M				agriculture
1184-18220 M				mountains, lake
-18222 M				mountains, lake, agriculture
1194-17385 M	x	x	x	
-17391 M	x	x	x	

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